ROCKS and MINERALS

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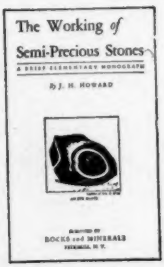

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Edited and Published by Peter Zodac

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JUNE 1935

VOL. 10, No. 6

WHOLE No. 48

Minerals of Whiteface Mountain

By D. H. NEWLAND, *State Geologist*,

Albany, N. Y.

The extensive rock cuts along the route of the Whiteface Mountain Memorial Highway, which will probably be completed before the coming summer is over, provide ready access to some of the characteristic features of Adirondack geology in general and of the particular makeup of this interesting culminating peak of the Lake Placid region.

A visit late in the fall of 1934—too late unfortunately to afford the best conditions for inspection, as the upper slopes were already ice coated—brought to light an unexpected array of rocks and minerals, within short reach of the roadway; what may lie in the less accessible outer zone has to be left to conjecture and from the casual visitor's viewpoint is perhaps of minor importance.

The road starts from the village of Wilmington at about 1019 feet elevation according to the Lake Placid sheet of the U. S. Geological Survey, and after a nearly straight easy stretch of four miles in a north-of-west direction up the valley between Wilmington Mountain and the north shoulder of Whiteface turns south and climbs steadily but by even gradient to close to the summit which is 4872 feet high, according to the same map. It is in this second stretch of nearly four miles that most is to be seen in the way of geology.

Whiteface has its name from the light color of the rock exposed on the cliffs and steep slopes of the summit. It in turn has become a familiar word to petrographers, many of whom may never have seen the mountain, as defining a peculiar rock type—Whiteface anorthosite. This differs from the normal or Mt. Marcy type in that the chief component, labradorite feldspar, occurs in crushed or granular condition. In other words the rock has been subjected to strong compressive forces which have produced granulation and gneissic structure, with the result that the normally dark more or less iridescent labradorite crystals often of large size are reduced to a dull greenish gray or white fragmented aggregate. Pyroxene and hornblende in black individual prisms and irregular clusters are sharply set off against the groundmass. Red garnet is a fluctuating ingredient. Altogether about 90 per cent of the rock normally consists of plagioclase and perhaps 10 per cent of pyroxene, hornblende and other dark minerals.

The bulk of the mountain consists of this Whiteface anorthosite, but here and there will be noted exposures of dark green syenite, reddish to grayish granite and small but sharply bounded ribbon-like volcanic dikes. Of the last named no less than eight individual bodies are exposed in a narrow zone of perhaps 200 feet width. Evidence of the titanic forces of upheaval that have brought this part of the Adirondacks into bolder relief than the rest is present in the vertical fault scarps that rise above the highway towards the top and the broad crush zones where the

rocks are so mashed and decomposed that their original nature is largely conjectural.

For the mineralogist the most attractive stretch, undoubtedly, is the last few hundred feet of the ascent. Bodies of coarse granite and pegmatite, indefinitely set off from the anorthosite so as to be considered more in the nature of schlieren than dike invasions, hold quite an assortment of minerals, allanite in broad tabular crystals, 4 or 5 inches in cross-section among the rest. Zircon and black tourmaline are found in sharply bounded individuals; biotite, muscovite and chlorite in rather good examples; also hornblende, magnetite, pyrite, feldspar, and other species in more or less attractive forms.

The allanite is lustrous coal black and shows on fracture surfaces thin coatings of pyrite. It is intergrown with feldspar along the crystal borders. The allanite when tested for radioactivity proved to be substantially stronger in that respecct than any mineral hitherto found in the Adirondack region.

Minerals with uranium and thorium contents, suitable for analysis to determine age relationships of the Adirondack Precambrian rocks, are not abundant. It is hoped that continued inspection of the various pegmatites, in occurrences like those on Whiteface Mountain, may eventually lead to securing such material and to make possible better correlations of the individual members of the Adirondack formations, which so far depend upon rather obscure field features. Also, such evidence might enable closer correlations to be carried out between the Adirondack and the Canadian Precambrian rocks, particularly of Ontario and Quebec where a good deal of work has already been done in radioactive measurements.

The Lake Placid sheet in which Whiteface Mountain lies has been surveyed geologically by W. J. Miller and the results are published in N. Y. State Museum Bulletin No. 211, 212 (1918).

"Determining Between Marcasite and Pyrite Concretions From Coal-Beds"

By WILLIAM C. McKINLEY

Concretions of both pyrite and marcasite occur commonly in the coal-beds of not only Illinois, but in other states; and to be more specific, these concretions are found in the strata **associated** with coal strata, and in many odd forms—flower-like, cylindrical, crudely crystallized, etc. Sizes range from pea-shape to comparatively huge specimens weighing up to about ten pounds (in this case the marcasite was a pseudomorph after wood).

To differentiate between marcasite and pyrite has been, in some cases, somewhat complicated to perform. A concise list, however, of suitable determinations are herewith described. The collector would do well to test his own specimens marked "pyrite" and "marcasite"—there may be some misnomers amongst them!

One determination is widely known—that of the nitric acid test (for which the reader is referred to Dana's Textbook). Another method is by the use of silver nitrate; when boiled in a weak (3 per cent) solution of silver nitrate, powdered pyrite tarnishes to a light brown color—whereas marcasite tarnishes to a brown, also, but then turns red, and finally assumes a blue shade under the same conditions.

Physical phenomenon presents another method of determination—pyrite on fresh surfaces, always has a light greenish caste, while marcasite tends more towards the "white" appearance. The marcasite found thus far has usually surface features of secondary crystallization, in drusy patches.

Special bibliograhy:

Born: Fibrous Pyrite From The Lead-Zinc District of Illinois—American Mineralogist, Vol. 19, No. 8, August, 1934.

Ekblaw and Carroll: Typical Rocks and Minerals In Illinois—State Geological Survey, Educational Series No. 3, Urbana, Illinois, 1931 (reprinted 1932).

Fluorine Minerals of Colorado

By RONALD L. IVES

Accurate information concerning the fluorine minerals of Colorado and their distribution is conspicuous by its absence. Miner's tales would indicate that every mine produces regularly specimens of fluorite that would rival the famous crystals from the Blue John Mine in Derbyshire, England. Careful investigation shows that most metal mines have fluorite in the gangue, often in appreciable quantities, but seldom in good crystals.

In this short article, an outline of the distribution of the fluorine deposits will be given, two areas producing commercial fluorite will be described, and the two little-known fluorine minerals —Creedite and Gearksutite—will be mentioned. Material used will be taken from reports of the Colorado Geologic Survey and personal observations only.

General Distribution

Fluorine minerals have been found nearly everywhere in the Front Range of Colorado, an area of mineralized Pre-Cambrian rock. The Sawatch and Sangre de Cristo Ranges have also produced some fluorine minerals. The geology of these two ranges is similar.

The San Juan mountains—consisting of complicated series of volcanics of Tertiary age—have also produced fluorite and other fluorine minerals.

Commercial production of Fluorite has come from Jamestown in the Front Range, Red Mountain and Wagon Wheel Gap in the San Juan Mountains.

The best Fluorite specimens have come from Crystal Mountain, near Florissant, where Amazonite, Smoky Quartz, Topaz and many other beautiful minerals are found. This area is now reported to be "stripped bare" of all types of minerals.

The Jamestown Area

The Jamestown area is roughly 50 miles northwest of Denver, and three miles west of the western edge of the sediments. It is reached by road through Boulder.

Although the geology of the area is not thoroughly worked out, there is good evidence of two mineralizations, and miners claim that there have been three. The first mineralization consisted of the intrusion of a number of porphyry dikes and a large mass of monzonite. The monzonite contains fluorite in irregular masses, sometimes described as lenses. At some later time, there was a second mineralization, during which veins containing pyrite were formed. Gold, carried by the pyrite, is mined at many places near Jamestown. Miners claim that a third mineralization brought in veins of tellurides. These veins are present, but there is little evidence that they were not formed at the same time as the pyrite veins.

Today, the monzonite is decayed until it can be worked with hand tools, without the use of explosives. The fluorite is mined by "gophering," no machinery, explosives or timbering being used in most mines. Only the purest material is mined, much good milling ore being lost by caving.

Samples of fluorite taken directly from the mine are a deep green to purple, but fade rapidly to a pale green or white. There are practically no good crystals, as the material is badly fractured, possibly by settling of the rock as it weathered. Fluorite also occurs as gangue in nearly all of the metalliferous veins in the area, and some of the dumps have been profitably worked for fluorite.

A peculiar specimen consisting of "clear, glassy, uncolored fluorspar enclosing long slender crystals of native tellurium, and small rounded pieces of a dull black mineral that reacted for uranium and copper" was found in the Alice Mine some years ago by Tom Mohr, a miner. This specimen was given to H. A. Aurand of the Geologic Survey, but has not been inspected by the writer.

Pieces of fluorite studded with small crystals of pyrite are common in the Jamestown area, being found where the pyrite veins cut the fluorite-containing monzonite.

Production from Jamestown has been small, as the silica content of the fluorspar has been high, probably due to poor milling methods. Reserves of fluorite are enormous, but the area will not be a large producer until the present methods of mining and milling

are greatly improved. About 20 mines are being operated part time, and spar brings from $5.00 to $9.00 a ton, according to the miners.

Wagon Wheel Gap

Wagon Wheel Gap is one of the most interesting nonmetallic deposits in Colorado, both from the mineralogic and geologic standpoints. It is situated on Goose Creek, near the Wagon Wheel Gap station of the Denver and Rio Grande Railroad. While situated in an area of tertiary volcanics, the fissure vein containing the fluorine minerals is still "live"-hot springs not far from the mines are still actively depositing minerals. While the connection between the vein and the hot springs has not been definitely proven, there seems to be no doubt of its actuality.

Fluorite, Gearksutite, Creedite, Barite and several other minerals have been reported from this vein. Fluorite has been produced commercially on a rather large scale, and small amounts of barite have been shipped.

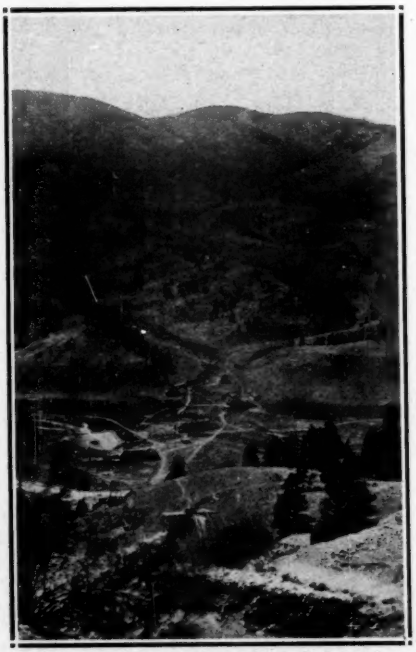


Photo by Aurand *Courtesy Colorado Geological Survey*

View of Wagon Wheel Gap fluorspar areas. Tramway of mine can be seen in lower left hand quarter.

Beautiful barite crystals have been found in the upper part of this vein, and here are found Creedite and Gearksutite.

The fluorite found here takes many forms, the most distinctive being radiating crystals, of varying color, but terminating in a green crystal. These are found along water courses in the vein.

No figures on recent production are available. The mine is said to be shut down, pending a rise in prices.

Gearksutite and Creedite

These two minerals were discovered in the Wagon Wheel Gap vein and first described by Larsen and Wells.

Creedite appears at first glance to be silicious sinter, but is softer. It is monoclinic, white to colorless, has a hardness of 3.5 and a specific gravity of 2.73. The crystals are prismatic, with curved faces. It fuses to a white enamel and is slowly soluable in acid. Creedite has the formula $CaSO_4.2CaF_2.2Al(F,OH)_3.2h_2O$.

Gearksutite occurs in the Wagon Wheel Gap vein as white balls, and has been found in the lower workings. Like Creedite, it is a fluorine mineral. Its formula is $CaF_2Al(F,OH)_3.H_2O$. Specimens available resemble white Bermuda onions, and have a greasy feel.

While neither mineral has been thoroughly studied as yet, there seems to be a definite chemical relation between them. Possibly, Creedite is the result of the combination of Anhydrite and Gearksutite.

Cryolite and a number of other rare fluorine minerals has been reported from the south side of Pike's Peak, near Colorado Springs. The presence of Cryolite is known, but the reports of the other minerals cannot be confirmed at the present writing.

From the small number of accurate reports, the larger number of doubtfully accurate reports and the enormous number of miner's tales, the following can be learned about the fluorine min-

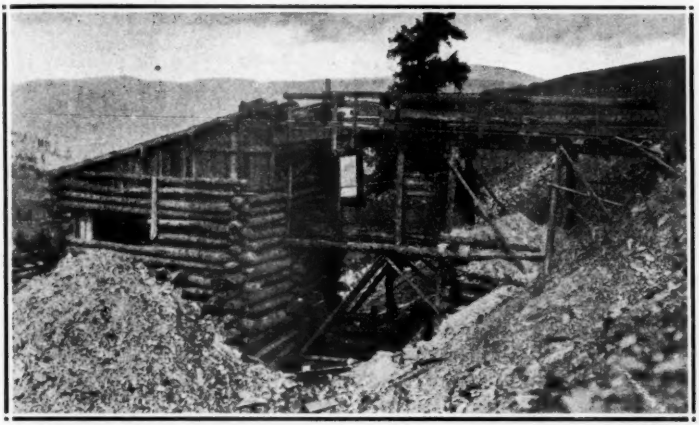


Photo by Aurand *Courtesy Colorado Geological Survey*

Upper terminal of aerial tram of Colorado Fluorspar Co. mine at Wagon Wheel Gap. Ore is sorted here before being trammed to the valley

erals of Colorado: Fluorite is common in nearly every mining region, but good specimens are rare, and are generally found in veins which do not produce commercial fluorite. Cryolite is found in one locality, not in commercial quantities. Numerous other fluorine minerals are reported, and a few have been definitely identified. Much of the state is unsurveyed, and prospecting has been very superficial. It is probable that in the future, there will be a number of good mineral areas found, which at present are either unknown, or very slightly known.

* * *

Bibliography:

Fluorspar Deposits of Colorado—Harry A. Aurand—Bulletin 18 of Colorado Geological Survey. This account, while out of date and covering only commercial deposits thoroughly, is the best material available. A very thorough investigation of the Jamestown fluorspar area by the U. S. Geologic Survey is in progress at the present time.

* * *

Mr. Elvis Tower and Mr. S. F. Johnson, miners at Jamestown, gave valuable assistance to the writer while on a field trip in the area.

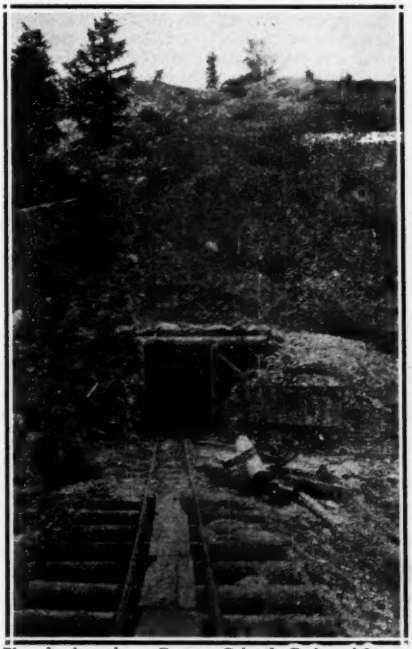


Photo by Aurand *Courtesy Colorado Geological Survey*

Main tunnel of Wagon Wheel Gap fluorspar mine.

Ilmenite at Bedford, N. Y.

By PETER ZODAC, *Editor Rocks and Minerals*

Ilmenite is rather an interesting mineral in as much as being black in color it is utilized in the manufacture of white paint. Cahen[1] says "It is admirable for use in towns or for laboratory paint work, as it retains its whiteness, where white paints soon discolor owing to the sulphur compounds in the atmosphere. Being considerably lighter than white lead it goes further. Should white lead be prohibited for the manufacture of paint, as it is to be hoped will one day be the case, here we have a substitute which is in every way as good and even better."

Although a number of quarries around Bedford are known, ilmenite has been found by the writer at only two of them, the Kinkel and the Clinchfield. It is at the Kinkel quarry where ilmenite is the more prolific but it is not found in commercial quantities, only as mineral specimens. Every specimen found by the writer occurred in but one form—thin plates imbedded chiefly in smoky quartz. This association, in smoky quartz, was so constant and persistent that it was the writer's belief it was associated with no other mineral. He was agreeably surprised Saturday, September 9th, 1933 to pick up a large broken crystal of salmon-colored microcline to find it contained ilmenite. A small bit of smoky quartz, however, formed one contact of the ilmenite, but the ilmenite extended beyond the quartz limit and penetrated the microcline for almost an inch. A small bit of the microcline contact was exposed and showed limonite staining. The ilmenite plate was less than 1/16 inch thick and what was present would not exceed 2 inches in length, though no doubt it was originally longer as both terminatios were broken off. One end of the ilmenite plate was split into two minute plates for a distance of ½ inch and the microcline penetrated the minute interval, between them. The total thickness of the split plates plus the microcline intrusion, is practically equal to the main plate. It is interesting to note that the split plates are not of equal length. One is ⅜ inch longer than the other. The shorter plate ends abruptly with its full thickness while the longer one gradually tapers out into nothing. Five other plates, of minute thinness and heavily coated with brown limonitic stains, may be seen in the microcline. One of the plates is wholly imbedded in the microcline.

Ilmenite has also been found imbedded as thin plates in milky quartz and in rose quartz and each was of good quality.

Two or three specimens of smoky quartz were found cotaining small flattened black tourmaline crystals forming the contact between the quartz and an ilmenite plate. The crystals were parallel to the length of the ilmenite and extended in all directions.

One specimen of smoky quartz was found with imbedded ilmenite that also contained black tourmaline crystals in which some of the tourmaline was altered into chlorite, one of the altered crystals being in contact with the ilmenite.

The ilmenite found at Bedford is of a dull black color and generally forms thin straight or wavy plates in smoky quartz. When the quartz is broken off so that the face of a plate is exposed, it is found to be very smooth as if it were polished and then resembles the polished face of a slickensided mineral. Sometimes only a minute scale is attached to the quartz but, once known, the mineral can always be recognized even if only a thin sliver is attached. However, it can easily be overlooked by the inexperienced collector when only thin scales are attached to a rock, as they resemble in a way biotite; but its hardness easily identifies it. Ilmenite is the only hard and black mineral found so far at Bedford that occurs in minute plates.

Another clue for the identification of ilmenite is the limonite stain which always accompanies it. Whether this staining comes from the mineral itself, as ilmenite contains iron, being an iron titanate, $FeTiO_3$, or from an outside source, is not known to the writer. The ilmenite always looks fresh and firm no matter how heavily it may be stained. The stains follow the contact of ilmenite with quartz. Therefore, if a smoky quartz specimen is noted that has a straight or a wavy brown line (a thin joint containing limonite) and

the specimen is broken open along this line, then 99 times out of a 100 it will expose an ilmenite plate.

Again many specimens of smoky quartz contain two or more plates of ilmenite that often if not always meet at an angle. When the quartz is hammered it generally breaks along the faces of the ilmenite and both the ilmenite and the quartz have smooth faces where they were in contact with each other.

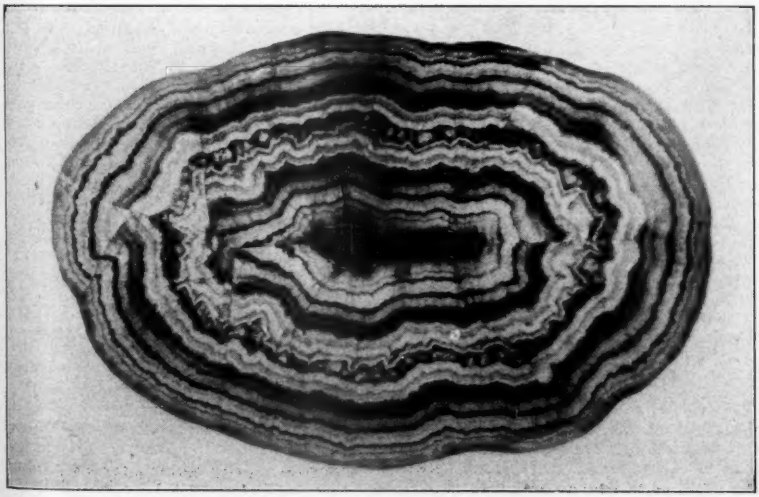
1 Cahen, Edward, *The Romantic History of Monazite*. ROCKS *and* MINERALS, March, 1928 Vol. 3, No. 1, p. 5.

Mineral Oddities

Though we think of fluorite generally as in the form of fine cubes of green, blue and purple colors and for which England is justly famous, another type is found in that country known as Blue-John fluorite. This is a delicately banded mineral, the bands being white to blue to black. It occurs as veins, nodules and also filling cavities in limestone at the Blue-John Mine, Castleton, Derbyshire, England. It takes a fine polish and is often worked into vases, dishes, and ornaments.

Blue-John was given its name by two miners, John Kirk and Joseph Hall, who found the deposit in contradistinction to Black-Jack, a local name for zinc blende.*

*Bottley, L. P., Blue-John Fluorite, ROCKS and MINERALS, March, 1928, Vol. 3, No. 1, Whole No. 7, p. 10.



J. Armitage, Photo

This is an exceptionally large section of a Blue-John Nodule—23½ inches in diameter.

The Genuine And Synthetic Ruby

By M. H. KOLLIDA

Synthetic stones have been produced by man for about 33 years now—ever since the momentous discovery and the invention of the furnace by Verneuil, a Frenchman, in 1902. He analyzed the genuine gem stone and using the same chemical components and fusing them cleverly, he reproduced the same stone that nature took eons of time to produce. The genuine and synthetic ruby are chemically absolutely the same. They both show double refraction—they both have the same refractive indices—the same specific gravity—the same hardness approximately although the synthetic may be brittle. In fact, many people believe that the synthetic ruby is more beautiful because it hasn't any of the cloudy aspects of a real ruby. Like many other things chemically reproduced, man not only tries to imitate nature but tries to improve on nature. So, a synthetic stone is a perfect stone—its color is of the best, its crystalline structure is clear, transparent, and flawless as compared with the genuine stone and it can be manufactured in sizes that could not be found but rarely in the mines at the present time. Also—an important factor—it is cheaper than the genuine stone. However, to many people, a stone loses its sentimentality, its value, its caste, if it is synthetic. They must have the genuine or none. To these people it might be enlightening to point out a few distinguishing marks between the genuine and synthetic rubies.

A genuine ruby is rarely perfect. It shows dichroism. The difference in color is very noticeable (except maybe light colored ones) when viewed in different directions but even these color variations can be copied beautifully. However, every genuine ruby shows dichroism. It has clouds and bubbles. It has "feathers" which in reality are fractures. It is unclean having flaws that are too small to allow microscopic analysis. It has needles. It may have sills—which are foreign crystals in a parallel arrangement. It may have any flaw that has an order to it suggesting the crystalline form as being typical of a natural stone. The synthetic stone, on the other hand, does not possess any of these defects. It has its own individual flaws that make its recognition possible. There are two paramount flaws—it is possible to detect curved growth lines—lines that show the growth, the building of layer by layer of the boule. It is also possible to detect bubbles that are curved. In addition, of interest to the lapidary, the orientation of the synthetic stone is hard to find.

In front of the Coolidge X-ray tube, the synthetic ruby glows and the genuine stone is dead. If a friend of yours has a "perfect ruby" be suspicious that it is synthetic. "Perfect rubies" are rarely made by nature and when she does make them, they command a fancy price especially if they are fairly large in size.

In addition to the synthetic stone which is used as a substitute for the genuine ruby, many other red stones are substituted. However, one can scarcely fail to distinguish the ruby from a stone which may be substituted for it, by its great hardness. After the diamond, corundum, of which the ruby is a member, is the hardest of all known minerals and will scratch any of the stones used as substitutes.

Rose-quartz is used for the stone known as Bohemian Ruby; rose-red topaz is used for the stone known as Brazilian Ruby; red garnet is used for stones known as Cape Ruby and Adelaide Ruby, which by the way are both fine garnets. The Adelaide Ruby when first discovered in South Australia was mistaken for the genuine ruby; so when the news first spread, twenty-four companies were formed for working the deposits and then after a more thorough examination, the stones were found to be red garnets of fine quality but compared with the true ruby almost valueless. The Siberian Ruby is in reality red tourmaline; the Arizona Ruby is a garnet as also is the stone known as Colorado Ruby.

The foregoing list shows that imitations and substitutions are numerous. Where a stone is fairly rare and as a result commands a good price, it is human nature to substitute if possible

and acceptible. Chemists on the other hand reproduce the chemical components of the genuine mineral and as an added reason to make it "cick" improve on nature by eliminating her flaws. To the sentimentalist the genuine ruby with its flaws has more meaning and value than a perfect one made by man. He attaches more value to it and as a result the genuine article commands a higher price. As in many things, it's all a matter of how you look at it. Many rubies mined do not make good gem material because they may be off color—too light perhaps and in such a case, to make it more salable, the color can be intensified by exposing the stone to radium or by treating it with heat. There are tricks in all trades and to make an inferior genuine stone desirable, when it is mounted in a ring, necklace, or bracelet, the stone is often backed by a foil of gold or copper which improves its appearance, usually darkening the color. In Burma it is customary instead of setting such a stone on a foil, to hollow out the underside and fill it with gold.

The more ingenious of humans have devised an admixture of the genuine and synthetic and have brought out the stones known as doublets and triplets. In the case of a doublet, the top layer is apt to be genuine whereas the pavilion of the stone would be glass of a superb red color, thereby giving the genuine ruby layer on top much better coloring and as a result, commanding a better price. In the case of a triplet, two genuine pieces of stone, usually of poor color, are pasted together with a thin slice of good colored glass in between to give the desired shade and the result is an almost all genuine stone possessing exquisite coloring and withstanding most of the tests given genuine stones particularly the hardness test. Because the ruby has been so successfully reproduced synthetically by the Verneuill process, doublets and triplets are not resorted to as much as previously.

All in all, it is easily discernable that camouflages and deceptions are practiced here to a great extent but where the beauty of the stone is improved making it more enjoyable to the owner, the deception if he knows wherein it lies, is not to be deprecated. True where the price soars sky high and the stone falsely sold, such a state is not to be countenanced but where an attempt is made to beautify and thereby raise its value proporionately, it is both satisfactory and worthwhile. After all, the chief value of a gem stone to the layman is its beauty.

ALFRED EMIL HAMMER

Alfred Emil Hammer, President of the Malleable Iron Fittings Company, a member of the Connecticut Historical and Scientific Societies and other organizations, business and social, died at his home in Branford, Connecticut on the morning of May 9.

Mr. Hammer was an enthusiastic botanist and devoted to mineralogy, being particularly interested in the rock formations of Connecticut, concerning which he has published several papers and booklets.

From the initial issue of ROCKS and MINERALS, Mr. Hammer was a subscriber to the Magazine and manifested a genuine interest in it by his contributions, new subscriptions and a gift of books. He was also an active member of the Rocks and Minerals Association.

His death is a real loss to the magazine and a cause of much sorrow to its Editor, who has had the privilege of knowing him personally and visiting him in his home.

How The Air Protects Us From Cosmic Bombardments

The air surrounding the earth is necessary not only to do its part in sustaining life, but also to act as a coat of armor against a constant bombardment by millions of meteorites which would otherwise slaughter humanity. So numerous are the meteorites that enter the upper atmosphere (estimated, on imperfect data, as high as neary a million an hour), and so great is their velocity, that if they reached the surface of the earh unimpeded they would probably make the loss of human life disastrous and on an unheard of scale, if they did not make life altogether impossible, according to Henry W. Nichols, who, as curator of geology at Field Museum of Natural History, Chicago, Ill., is in charge of the world's largest collection of meteorites. Fortunately, says Mr. Nichols, the air interposes an obstacle or cushion through which few meteorites can pass, and those few only with such greatly reduced speed and loss in size through oxidation and consumption that to date throughout the world since recorded history began, there is no authentic instance of a human being having been harmed by one, and only about eight cases of property damage done by them.

"Most meteorites are very small, comparable with grains of sand in size, but as most of them enter the air at speeds between eight and forty-four miles per second (480 to 2,840 miles per minute, or 28,800 to 170,400 miles per hour) even such small particles would become deadly projectiles," says Mr. Nichols. "A meteorite that weighs only one pound, moving at a speed of 44 miles per second, would strike with a force of 800,000,000 foot pounds. The smashing power of a meteorite of even moderately large size would be much greater. Luckily, even the extremely rarefied upper air opposes a strong resistance to bodies moving at such enormous speeds. The friction of passage rapidly reduces the velocities to moderate values comparable with those of ordinary falling bodies. Sufficient heat is generated by this friction to heat the surface of the meteorite to incandescence. The surface melts and a film of molten matter covers it, which is rapidly blown away by the powerful air currents generated by the passage and trails behind forming the luminous trail seen behind meteors and shooting stars. Thus the substance of the meteorite is consumed and nearly all meteorites are thus destroyed completely before coming into contact with the earth. An iron meteorite would have to weigh from ten to twenty pounds for even a small core to persist until it reached the solid earth, and few are as large as this. The meteorites that have fallen on the earth are but the remnants of much larger bodies.

"The height at which the initial velocity of nine meteorites was overcome, and from which they fell under the influence of gravity alone, has been computed at about two and one-quarter to twenty-nine miles above the earth's surface. The few giant meteorites weighing thousands of tons each which made the craters such as Canyon Diablo in Arizona are exceptional, and their tremendous weights were sufficient to overcome in great degree the retarding effect of the atmosphere."

The Field Museum collection contains representatives of more meteorite falls than any other collection. More than two-thirds of all known falls are represented. Included are an iron meteorite weighing 3,336 pounds, and two of the largest known individual stone meteorites, one of those latter being the largest ever seen to fall, and the other the largest ever found. More than two tons of specimens from the famous Canyon Diablo locality are shown. In all, the museum collection contains more than 700 meteorite specimens.

A Cosmopolitan Specimen

By PETER ZODAC

The Editor of ROCKS and MINERALS, on one of his mineralogical excursions, brought back with him a piece of granite, 2 x 3 inches in size and weighing 6 ounces. It is rather unattractive looking but was taken because it contained some leucoxene. Being attracted, somewhat, by other minerals appearing to be in the specimen, it was found also to contain albite, chlorite, epidote, hornblende, limonite magnetite, pyrite, quartz and titanite, besides the leucoxene, ten minerals in all in this piece of granite.

The specimen was collected at the old Denny Magnetite Mine in Putnam County, New York (about 10 miles north of Peekskill) Tuesday, April 2, 1932, when the locality was visited with Judge Chester Nelson of Garrison, N. Y. and Mr. Allison Albee, of Rye, N. Y. The minerals in the specimen at best were only fair in quality. They were:

Albite—Whiteish in color, crystalline, as a constituent of the granite.

Chlorite—As a thin crust, pale green in color.

Epidote—Occuring in small masses, poor in quality.

Hornblende—Greenish in color, in small masses, as a constituent of the granite.

Leucoxene—The most interesting mineral in the specimen and a most pleasant surprise, occurs in long slender, wedge-shaped crystals of a cream color, pseudomorph after titanite. The crystal are of fair quality.

Limonite—Brown stains on the granite.

Magnetite—Small grains and masses.

Pyrite—Minute grains.

Quartz—Massive and milky-white as a constituent of the granite.

Titanite—Present in small, brown, wedge-shaped crystals but only of fair quality. On one face of the granite, the titanite has altered into leucoxene; on the opposite face it is unaltered.

How many of our readers can match this or exhibit a specimen with a greater number of minerals in its composition? Those who can beat the Editor we hope will drop a line to ROCKS and MINERALS describing what they have. Remember this is not to be a microscopic examination but only such as can be made with the ordinary magnifying glass.

MR. VARNI ADDRESSES GEOLOGY CLUB

On April 9th, Mr. Stephen Varni of Stephen Varni Co., New York City, addressed the Geology Club of Princeton University at Princeton, N. J. The subject of Mr. Varni's talk was gems and gem anecdotes, and was illustrated by 38 lantern slides of some of the famous gems of the world. A moving picture on gem cutting and polishing which Mr. Varni had taken a few years ago by Paramount Pictures (Bray Educational Films) was also shown.

MINERALOGY QUIZ

(Answers on Page 95)

1. What is Cinnamon Stone?
2. How did its name originate?
3. What is its scientific name?
4. In what form is it commonly found?
5. Can it be used as a gem?

THE AMATEUR LAPIDARY

Conducted by J. H. HOWARD*

504 Crescent Ave., Greenville, S. C.

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all.

*Author of—*The Working of Semi-Precious Stones.* A practical guide-book written in non-technical language for those who desire to cut and polish semi-precious stones.

Polishing Rocks By Hand

By WAYNE PROELL

The polishing of rocks and minerals is a process quite familiar to geologists and amateur lapidarists. The geologist uses the process for the preparation of specimens which reveal in greatest detail the fine structure of rocks; the lapidarist polishes rocks to better display their beauty.

The standard rig for the polishing of rock specimens includes several motor-driven steel wheels on which the rock is flattened and ground down by means of carborundum, and polishing laps on which the smooth-ground rock is polished. The process of polishing and grinding is rapid and gives satisfactory results. Nevertheless, there are several disadvantages inherent in the method, which are best overcome by the use of another method.

First, what are the disadvantages of the motor-driven outfit? Perhaps the prime disadvantage is its expense. Motor, shafting, belts, laps, and pulleys must be used. Besides these, the amateur requires mechanical skill and a lot of room. The grinding wheels use up carborundum very rapidly, and the whirling wheels spray the various muds and grinding compounds far and wide. A second disadvantage is the noise which the motor outfit makes. Further, the motor requires electricity, which is not always available. The motor outfit is not portable, and as a result cannot be used in field work.

The process of polishing a rock includes several steps, of which the first is the flattening of the specimen on one side, and then further smoothing of the flat surface with varying grades of carborundum and finally rouge, until the polished surface is formed.

In hand polishing. the apparatus required is relatively simple. Here is a list:

5 steel plates, 10 x 10 x ¼ inch.

5 one pound tins or bottles.

1 pound of each of the following: No. 60, 180, F, 600 carborundum; jeweler's rouge; paraffin; pitch or asphalt (without sand).

The steel plates are used as tools. Each of four plates is reserved for a separate grade of corborundum. The rock to be polished is rubbed vigorously over a plate with a small amount of carborundum and water, until the rock is flattened and smoothed sufficiently. The process is initiated with coarse (No 60) carborundum, and the angular rock is thus given a large flat facet. After washing in clear water, the rock is rubbed on the next plate with the next finer grade of carborundum. This is repeated till the finest grade of carborundum,, No. 600, is used. This is used for about five minutes, to get rid of all coarse pits. The time needed for grinding a 2 x 3 surface down a quarter of an inch is about the following:

No. 60—10 minutes.
No. 180—5 minutes.
No. F—2 minutes.
No. 600—5 minutes.

This is a liberal estimate. which can often be cut in half. The final polishing of the rock takes from 10 minutes on. A good polish is attained in ten minutes. but finer polish is attained with longer rubbing.

The best method for polishing is the rouge-pitch method. A practiced hand can produce polished surfaces which are optically flat by using the pitch lap. The lap is made in the following manner: The fifth steel plate is laid on a flat surface. and a wall of wet paper or clay is made around its perimeter. The plate must be dry. Then a pound of pitch is melted, and about half a pound of paraffin is added to the melt. The hot pitch melt is poured onto the plate. It soon solidifies, but if there is enough pitch in the melt. the coating of pitch will remain soft but not sticky. A wet, soapy rag is then laid upon the surface, and a flat piece of glass is laid upon he rag. The glass plate presses the warm pitch into a very flat surface, and the rag prevents sticking. After the pitch is cooled, the glass plate is removed, and the surface of the pitch is divided into small squares about one half inch square by means of thin, shallow grooves. When a mud of rouge and water is applied to the lap, it is ready for polishing. The polishing merely consists of rubbing the rock surface on the lap for the required time.

This method of polishing is not unique. It is much used in the production of telescope lenses and mirrors, though I have never seen it applied to rock polishing before.

The accuracy of the method is far superior to the machine method, as is evidenced by its use in telescope construction. (See the book **Amateur Telescope Making** for complete details of hand polishing of glass). Scratches, which are common in the fine grinding with wheels, are very rare with hand polishing. The finished polish is perfectly even and free of striations.

It is well to summarize the disadvantages of hand polishing. First, it is slower than machine polishing. Second, the polishing of small facets is quite difficult. In the matters of high speed and small faceting the machine polisher remains supreme.

The advantages of hand polishing include the following: portability, inexpensiveness, accuracy, quietness, neatness, and low operating cost. The quietness of operation makes the apparatus very useful in city apartments, where noise of motors is undesirable. There are no rotating wheels to throw mud and rouge. Further, the fine grinding proceeds much more smoothly than with wheels. I have seen rocks being fine-ground by machine suddenly grip the wheel and tear loose from the worker's hands and then fly off at high velocity. This cannot occur with stationary apparatus. Neither can abraded knuckles and cut fingers. The only operating cost is the expense for carborundum, of which much less is required than for wheel outfits, and "elbow grease." The inexpensiveness of the outfit makes hand polishing accessible to those who do not intend to do so much polishing as to justify the purchase of heavy equipment, as well as to those who are doubtful as to whether or not they wish to polish stones. The small outlay required thus enables doubtful amateurs to try polishing as an experiment.

The utility of polished rock surfaces is seldom realized by amateur geologists. Besides rendering many of the obscure details of rock structure visible —as veining, faulting, fracturing, crystallization—the polished surface shows up metallic materials very distinctly. Thus small grains of pyrites, hematite, copper, and similar minerals which cannot be seen on the fractured rock surface, even with a hand lens, show up with great distinctness upon polished surfaces. The transparency and development of grains, striae, and inclusions is also well shown. Further, the hardness of individual grains of minerals in a rock such as a granite can be readily found. Upon a fracture, these grains are weakened so that tests are of little significance.

The beauty and utility of polished rock specimens has long been known. The apparatus, for amateurs at least, has usually been difficult of access. I hope many amateurs will find the portable hand polishing outfit handy, cheap, durable, and useful.

Club and Society Notes

New Britain Mineralogical Society

The New Britain Mineralogical Society of New Britain, Connecticut, formed to stimulate interest in Connecticut minerals and build up a collection of them for the High School in which the Society meets, was organized on February 14, 1935. Its officers are C. Davis Chase, President; J. P. Mortelletti, Secretary and Chairman of the program committee. The regular meetings are on the 1st and 3rd Mondays of each month. The 1st outing was a visit to the mineral collection at Wesleyan University with a side trip to the Toll Gate quarry in Higganum. Starting with a membership of 12, there are now 23 members, including a number of high school seniors and graduates. There are no dues.

The Society has become affilliated with the Rocks and Minerals Association and its members are urged as far as possible to become subscribers to ROCKS and MINERALS.

New Haven Mineral Club

A number of field trips for the summer have been arranged and members and their friends are urged to attend each and every one of them. The first trip will be

Sunday, June 16th—Consolidated Feldspar Quarries, Bedford, N. Y.

Members will meet at 9:00 A. M. (D.S.T.) at Peabody Museum, New Haven, Conn., at the quarries at 10:00 A. M. (D.S.T.). Those having cars with room for an extra passenger or two, are requested to pick up members.

Subsequently trips will be listed in ROCKS and MINERALS.

Acknowledgments

We wish to acknowledge receipt and express our sincere thanks for specimens and other donations recently sent us by some of our subscribers.

Anderson, H. Alban, Peekskill, N. Y., two rare old volumes on New Jersey geology.

Barclay, Geo. C., Newport News, Va., Calcite (crystal cast from fossil shell), Yorktown formation, Yorktown, Va. The specimen is both fluorescent and phosphorescent.

Clinesmith, C. N., Ellensburg, Wash., 5 blue agate specimens from his locality.

Gem Shop, Helena, Mont., A large assortment of choice crystals to be used as premiums for new subscriptions.

Forbes, P. L., Stauffer, Ore., another large assortment of interesting iridescent obsidian from his famous locality.

Lewis, W. Scott, Hollywood, Calif., two specimens, colemanite and halite, from Death Valley, Calif.

Morlon, Jorge, Havana, Cuba, two specimens, chromite and plasma, from Sabana de San Miguel (Metanzas) Cuba.

Olympic Indian Trading Post, Seattle, Wash., two novelty pots made up of cemented pebbles; very unique and beautiful.

Perry, Karl Proctor, Hartford, Conn., first-day cover (Connecticut Ter-centenary).

Shephard, G. Frederick, Chicago, Ill., a copy of "The Story of Diamonds" by A. C. Austin and Marion Mercer.

Stone Studio, Peekskill, N. Y., a large number of polished specimens including augite porphyry, orange calcite and lepidolite.

Ward's Natural Science Establishment, Rochester, N. Y., a cloth bound copy of their recent price list with the Editor's name stamped in gold on the front cover.

Bibliographical Notes

Ward's New Catalog

Reviewed by H. ALBAN ANDERSON

Ward's Natural Science Establishment's latest catalog, No. 35, is so attractive in appearance and so interesting in contents as to lift it out of commercial publications of like character and to place it in a class by itself. Indeed, Ward's has become quite conscious of this, for the unprecedented request for copies leaves no doubt that others than old and new customers, among whom it was to have had a f[illegible] circulation, are writing in for cat[illegible]. To protect themselves against the curious and catalog collectors, it has been necessary to impose a charge of fifty cents a copy, that sum to be credited upon the first order of a reasonable amount received from the purchaser.

The catalog is 8½ by 12 inches, bound in a stiff paper cover. It is printed on a glazed paper in large type comfortable to read, and is profusely illustrated with cuts made from photographs of just the kind of mineral specimens one would like to see in his own collection. The classification of species is on a chemical basis, following the Dana System and the fourth edition of Dana's Handbook of Mineralogy. The System's classification numbers are given and the chemical formulae in general use. An alphabetical index furnishes a cross reference to the chemical classification. More important species are followed by some explanatory note, as "248. CASSITERITE—SnO_2. The chief ore of tin. One of the few essential ores not found abundantly in the United States." And be[illegible] the specimens offered are sufficiently described to denote their form and character.

Fluorescent minerals, cabinets in which to display them and violet ray lamps; all the accessories for collecting and exhibiting specimens; economic and geological collections; meteorites, palentological specimens etc., etc., are also listed and illustrated, for Ward's is a Natural Science Establishment, not limited to minerals only.

For all those truly interested in minerals the catalog is well worth possessing and preserving, not only for its fine illustrations and its information as to species, etc., but also for such introduction as it gives to other fields akin to minerals, for which, however, the mineralogist would not altogether forsake his favorite hobby.

ATTENTION DIRECTORS OF OUTINGS

Please send in reports on your outings so as to reach us by the 20th of June, at the latest. The number present, special finds and incidents will be interesting.

If every director co-operates, a complete report on the Third National Outing will be printed in the July issue.

MINERALOGY QUIZ—Answers

(Questions on Page 91)

1. A variety of garnet.
2. It gets its name from two sources; found in the gem gravels of the Cinnamon Islands of Ceylon, and is also of a cinnamon color.
3. Hessonite or Essonite.
4. As crystals and water worn pebbles.
5. Yes, it is easily cut and its facets cause it to sparkle like a Canary diamond.

Reader's Section

AN AMUSING INCIDENT

Editor "R. & M."

I wish to compliment you on your neat, compact and interesting magazine "ROCKS and MINERALS". It is instructive and entertaining to all collectors of minerals. It puts me in mind of a similar magazine published back in 1888 and 89, edited by Thos. Chamberlain, Jr., published at Jersey City, N. J., under the name of "THE EXCHANGERS' MONTHLY" and devoted to Mineralogy, Geology and Archaeology. I do not know if this magazine is still published or not, as I lost sight of it some years ago, but in its day it was a very live paper in its line.

In looking over my collection recently, I ran across a specimen of pipestone that reminded me of an amusing incident. At the time I was a salesman on the road and had occasion to spend a week-end at Pipestone, Minn. While sitting around the Hotel office one Saturday evening, we got to talking about the Indian Reservation, located only a mile from town, and some of the boys made up a party for a trip out to it on Sunday. As this was before the auto age it was a case of using "Shanks Mares" but we arrived without over exerting ourselves. We found only one family, an Indian, his wife and several children, all sitting under a wagon for protection from the sun, as it was a warm summer's day with a bright sun overhead. The Indian was seated on the ground, working up several pieces of pipestone into pipes, some just started, others partly finished. We inquired the prices but he did not appear able to talk although he seemed to understand us all right, as for one particular piece he held up 5 fingers. We understood that must mean something but not just what, so I pulled out my pocket book and showed him a penny. He shook his head. Then I showed him a nickel, and he shook his head. Then I showed him a dime and he immediately nodded his head, so it was evident that 50c was the price for a partly finished pipe. He had shaped the outside but had not bored the bowl. I still have it in my collection. It seems that when the stone is first taken from the ground it is soft and easily carved but on exposure to the air it becomes hard. About the only tools the Indian seemed to have were a knife and file. This particular piece of pipestone is a reddish clay stone called "Catlinite" in Dana's.

One of the boys had a 4 x 5 camera and while we were bargaining for specimens he was preparing to take some pictures of the family under the wagon, when he was spyed by another group of Indians who had just come on the grounds. They raised a great shouting and took after him on the double quick. He had ridden down on horseback and he just managed to get on his horse as they were ready to close in on him. He lit out for the hotel as fast as the horse would go, leaving his camera and outfit behind and I assure you there was not much left of the camera when the Indians got through with it. It seems these Indians were very superstitious and believed it was "bad medicine" to have their pictures taken. We had quite a jolly time with the young fellow when we got back to the hotel, joking him on his adventure and assuring him that he would make a fine jockey if he could keep up that speed all the time.

J. G. WAINWRIGHT.

Waukegan, Illinois.

HOW ABOUT IT?

Editor "R. & M."

I would suggest that the different states have their National field days on different dates so members can attend more than one. For example I would like to attend the New York, Connecticut, Rhode Island and Massachusetts outings but cannot because they are all on the same day.

MRS. CHARLES WORLEY.

Wellesley Hills, Massachusetts.